

REMARKS/ARGUMENTS

Reconsideration of this application is requested. Claims 1-8 will remain active in the application subsequent to entry of this Amendment.

Discussion of Amendment to the Claims

Claim 1 is amended in order to clarify the invention and follow the Examiner's suggestions on page 3, first paragraph of the Official Action, namely that Applicants were relying upon features not recited in the claims.

In the above amendments to the claims, claim 1 is amended to include the feature that the binder (C) has a $\text{TiO}_x\text{C}_n\text{H}_m$ structure containing organic unreacted groups. This newly added limitation is supported on page 13, second paragraph of the specification.

The technical advantage achieved by the binder (C) having the titanium alkoxide-based $\text{TiO}_x\text{C}_n\text{H}_m$ structure is described on page 13, second paragraph, which states:

“The binder formed of hydrolysis condensate of a titanium alkoxide in the present invention has a $\text{TiO}_x\text{C}_n\text{H}_m$ structure containing not a few organic unreacted groups, and it is not easily crystallized at a temperature equivalent to, or lower than, the combustion temperature of an organic substrate. That is, it has an amorphous form at 200°C or lower, and the film does not come to have fragility caused by crystallization, and it is essentially different, for example, from an amorphous titanium oxide formed of titanium peroxide.”

As this amendment serves to advance prosecution and follows the suggestion contained in the currently Official Action, at the very least entry of this amendment is appropriate.

Response to Prior Art-Based Rejection

The sole issue raised in the outstanding Official Action is the patentability/"obviousness" of claims 1-8 considering U.S. 6,071,606 to Yamazaki et al in view of U.S. 5,897,958 to Yamada et al.

As a consequence of this amendment, the photocatalyst coating liquid defined in amended claim 1 (hereinafter referred to as the "coating liquid of the present invention") differs from the coating liquid disclosed in Yamazaki et al U.S. '606 cited as the primary reference.

The coating liquid of the present invention comprises (A) titanium oxide fine particles formed of anatase type crystal as a main component, (B) colloidal silica and (C) a binder formed of a hydrolysis-condensate of a titanium alkoxide and having a $\text{TiO}_x\text{C}_n\text{H}_m$ structure containing organic unreacted groups. The titanium oxide fine particles (A) and the colloidal silica (B) are dispersed in the $\text{TiO}_x\text{C}_n\text{H}_m$ structure-containing binder (C).

The film formed from the coating liquid of the present invention has a disperse phase of TiO_2 fine particles (A) and colloidal SiO_2 (B) and a matrix phase of $\text{TiO}_x\text{C}_n\text{H}_m$ -containing binder (C).

In contrast to claim 1 and the coating liquid of the present invention, the coating liquid described in U.S.'606 contains a first essential sol containing a precursor of titania (col. 2, lines 15-16), a second essential sol containing at least one compound of silica and alumina (col. 2, lines 16-17 and lines 24-25) and a third optional sol containing a precursor of amorphous metal oxide such as silica sol, silica-alumina sol or silica-zirconia sol(col. 3, lines 19-24).

The film formed from the coating liquid of U.S.'606 has a disperse phase formed of at least one compound of SiO_2 and Al_2O_3 and a matrix phase formed essentially of TiO_2 and an optional amorphous metal oxide (SiO_2 , Al_2O_3).

As is clear from above, the coating liquid of the present invention differs from that of U.S.'606 in at least the following points.

The coating liquid of the present invention contains the TiO_2 fine particles (A) as a disperse phase, whereas the coating liquid of U.S.'606 does not contain such TiO_2 fine particles as a disperse phase. In the coating liquid of U.S.'606, TiO_2 forms a matrix phase.

The coating liquid of the present invention contains the $\text{TiO}_x\text{C}_n\text{H}_m$ structure-containing binder (C), whereas the coating liquid of U.S.'606 does not contain such a binder but instead contains a precursor of titania(TiO_2) as a binder.

Yamada et al U.S.'958 cited as a secondary reference, does not cure the defects of Yamazaki.

In Office Action, page 3, last paragraph, the Examiner states that U.S.'958 discloses that titanium oxide (TiO_2) made from titanium alkoxide acts as a binder. However, the binder (C) used in the present claim 1 has the $\text{TiO}_x\text{C}_n\text{H}_m$ structure and is not TiO_2 . As a binder, the binder having the $\text{TiO}_x\text{C}_n\text{H}_m$ structure is excellent as compared to TiO_2 as is described in applicant's specification, page 13, second paragraph ad discussed above.

For the above reasons claim 1 is not at all obvious over U.S.'606 in view of U.S.'958. Further, since claims 2 to 8 are each directly or indirectly dependent upon the claim 1 and include the features of the patentable claim 1, they are similarly patentable.

Claim 1 is amended in order to correct the spelling of "solid" in the last line and is responsive to the examiner's objection as to informalities. The claim is also amended to remove the term "type" which is usually regarded as an objectionable term as well.

The balance of the Official Action relates to a single prior art-based rejection directed to all claims.

Claims 1 to 8 are rejected under 35 USC 103(a) as being unpatentable over Yamazaki U.S. 6,071,606 ("U.S. '606" hereinafter) in view of Yamada U.S. 5,897,958 ("U.S. '958" hereinafter).

Claim 1, discussed herein as a representative claim, is directed to a photocatalytic coating liquid. The photocatalytic coating liquid has essential requirements that: (1) it comprises (A) titanium oxide fine particles formed of anatase type crystal as a main component, (B) colloidal silica and (C) a binder formed of a hydrolysis-condensate of a titanium alkoxide and that (2) it has a component (A) content of 5 to 50 mass%, a component (B) content of 25 to 75 mass% and a component (C) content, as a TiO_2 solid content, of 10 to 55 mass% based on the total solid content.

As is clear from the above essential requirement (1), the photocatalytic coating liquid of claim 1 has a structure in which the anatase type titanium oxide fine particles (A) and the colloidal silica (B) are dispersed in the binder (C) as a kind of matrix. According to the description, page 13, second paragraph, the binder (C) is a product that is obtained by hydrolysis-condensation of a titanium alkoxide and has a $\text{TiO}_x\text{C}_n\text{H}_m$ structure containing organic unreacted groups. It should be emphasized that the binder (C) is not TiO_2 .

Page 13, second paragraph of the specification describes that the use, as a binder, of the binder (C) having the titanium alkoxide-based $\text{TiO}_x\text{C}_n\text{H}_m$ structure improves the durability of a film more than the use of TiO_2 as a binder.

In the above essential requirement (2), the amounts of the components (A), (B) and (C) are limited to the specified ranges, respectively. The technical significance of this limitation will be apparent by comparing the results of Examples 1 to 9 and the results of Comparative Examples 1 to 9 in Tables 1 and 2 on pages 37 and 38 of the description.

The coating liquid described in U.S. '606 contains a first essential sol containing a precursor of titania (col. 2, lines 15-16), a second essential sol containing at least one compound of silica and alumina (col. 2, lines 16-17 and lines 24-25) and a third optional sol containing a precursor of amorphous metal oxide such as silica sol, silica-alumina sol or silica-zirconia sol (col. 3, lines 19-24). The hydrophilic film obtained has a matrix phase formed essentially of titania and optional amorphous metal oxide (silica, alumina, zirconia) and a disperse phase formed of at least one compound of silica and alumina.

When a film formed from the coating liquid of the present claim 1 and a film formed from the counterpart of U.S. '606 are compared, the former and the latter are significantly different in that, in the former, titanium oxide fine particles (A) and colloidal silica (B) are dispersed in the binder (C) having the $\text{TiO}_x\text{C}_n\text{H}_m$ structure and that, in the latter, the matrix phase formed of essential TiO_2 and optional metal oxide of silica, alumina or zirconia forms a continuous phase in which silica or alumina is dispersed (see col. 2, lines 26-43 of U.S. '606).

In U.S. '606, TiO_2 constitutes a continuous matrix phase and is not dispersed in the form of fine particles. On this point, U.S. '606 is completely different from applicants' invention as defined in claim 1.

In Office Action, page 3, last paragraph, the Examiner states that Yamada U.S. '958 discloses that titanium oxide made from titanium alkoxide acts as binder. However, the binder (C) used in the present claim 1 has the $\text{TiO}_x\text{C}_n\text{H}_m$ structure and is not TiO_2 . As a binder, the binder having the $\text{TiO}_x\text{C}_n\text{H}_m$ structure is excellent as compared to TiO_2 as is described in applicants' specification, page 13, second paragraph.

For the above reasons, claim 1 is not at all obvious over U.S. '606 in view of U.S. '598.

Since claims 2 to 8 are each directly or indirectly dependent upon the claim 1 and include

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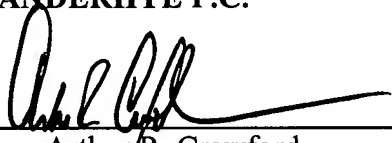
the features of the patentable claim 1, they are similarly patentable.

For the above reasons, it is respectfully submitted that the claims of this application define inventive subject matter. Reconsideration, entry of this amendment and allowance are solicited. Should the Examiner require further information, please contact the undersigned.

Respectfully submitted,

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